MESOSCALE DISPERSION OF ^{85}KR IN THE VICINITY OF LA HAGUE REPROCESSING PLANT

[1]CONNAN O., [2]SMITH K., [1]SOLIER L., [1]MARO D., [1]HEBERT D., [1]BACON G. & [3]TENAILLEAU L.

[1]IRSN/DEI/SECRE, Laboratoire de Radioécologie, Cherbourg-Octeville
[2]RPII, Radiological Protection Institute of Ireland, Dublin
[3]EAMEA, Groupe Etudes Atomiques, Cherbourg-Octeville
Olivier.connan@irsn.fr

Predicting the dispersion of a radioactive plume, and estimating the radiological consequences for the population, following an unplanned atmospheric release of radionuclides are crucial steps in an emergency response. Atmospheric dispersion models (ADM) including ADMS, HYSPLIT and RIMPUFF can be used for this purpose. These ADMs must be evaluated to determine the degree of confidence that can be placed on their predictions. One approach involves comparing predictions from the ADMs with data sets of measurements. However, there are few measurement data available at mesoscale distances (up to 100 km) for this purpose.
Krypton-85 (^{85}Kr), a □ and □□emitting radionuclide, released during the reprocessing of spent nuclear fuel at the AREVA NC - La Hague plant (France) can be used as a non-reactive tracer of radioactive plumes. In the vicinity of the source, high ^{85}Kr air concentrations allow real-time measurements to be made. However, a pre-concentration step in the sample analysis is required when the ^{85}Kr air concentration is low. The IRSN (Institut de Radioprotection et de Sureté Nucléaire) has developed a method comprising concentration on activated charcoal, gamma spectrometry, and mass spectrometry. This allows ^{85}Kr to be measured down to atmospheric background levels.
The IRSN performed a series of air sampling campaigns at mesoscale distances (20 -100 km) from the reprocessing plant between 2007 and 2009. These samples were collected in order to: (i) test and optimise the ^{85}Kr measurement technique at low concentrations, (ii) to investigate the performance of ADMs by comparing the ^{85}Kr air concentrations predicted by the models with IRSN measurements and (iii) to assess the ability of ^{85}Kr to be used as a tracer at mesoscale distances.
In this study, real-time ^{85}Kr measurements were recorded at 18 km from the source and ^{85}Kr measurements at distance varying between 20 and 80 km were made using the pre-concentration method. These measured ^{85}Kr air concentrations were then compared with the predictions of ADMs models.
The detail of the method, with qualities and defects, results of experimental campaigns, illustration of these results to qualify ADMs models like ADMS, HYSPLIT or RIMPUFF are presented. The ability of ^{85}Kr to be used as tracer at mesoscale distance will be discussed. Finally, preliminary conclusion about the ability of models to reproduce experimental results will be proposed.